The Niton Multi-Element Spectrum Analyzer

Technical Demonstration Summary Sheet

NITON 700 SERIES MULTI-ELEMENT SPECTRUM ANALYZER (LEAD PAINT ANALYZER)

THE NEED

A need exists for in-situ real-time analysis to identify and quantify lead, cadmium, chromium and other metals in lead based paint. The current method includes collecting a paint sample and shipping the sample to a laboratory for analyses. Typically this costs over $1,000 per sample and takes up to three months.

THE TECHNOLOGY

The Niton 700 series analyzer is a hand held, battery-operated unit which is 8" x 3" x 2" and weighs 2.5 pounds with a price of approximately $25,000. The analyzer uses X-ray fluorescence (XRF) spectrum analysis to identify and quantify metals and elements in lead-based paint. All eight Resource Conservation and Recovery Act (RCRA) metals and up to 17 other elements can be characterized within seconds. The analyzer uses two radioactive sources, Americium-241 to test for antimony, barium, cadmium, indium, iodine, palladium, silver, and tin, and Cadmium-109 to test for arsenic, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, rubidium, selenium, strontium, titanium, zinc, and zirconium. The unit can be carried, shipped, and transported without exterior labeling conforming to 49 CFR 173.421. Batteries are good for 8 hours and can be charged in less than 2 hours. The analyzer can store up to 3,000 data sets including sample locations. Placing the analyzer against a painted surface opens the shutter window. Within seconds the unit beeps indicating the end of the reading and the data is displayed. Data is easily downloaded to a conventional personal computer.

THE DEMONSTRATION

The Niton 700 series analyzer was demonstrated in February 1999 at Idaho National Engineering and Environmental Laboratory (INEEL) as part of the INEEL Large Scale Demonstration and Deployment Project. This work was funded by DOE's Federal Energy Technology Center (FETC) for the D&D Focus Area. The technology was demonstrated at three INEEL facilities. It was used to identify and quantify metals in paint at several locations at each facility. At one facility paint samples were collected and sent to a laboratory for analysis for future comparison with the Niton analysis from the same location. At the other facilities the unit was tested against existing laboratory analysis from known locations. The unit was calibrated in the laboratory, again in the field prior to taking readings, periodically during data gathering and again at the end. The unit was then placed against a painted surface for 20 seconds. The list of metals and elements was then compared to the existing lab list.

THE RESULTS

The data produced by the Niton 700 confirmed the lab analysis within acceptable limits. Theoretically the Niton data would be more precise than the lab data since the lab samples are probably contaminated by typical sample gathering techniques. The Niton readings were made in seconds compared to hours to collect samples and months to obtain lab analysis. The analyzer was user friendly and simple to operate and understand. The output from the Niton is in mg/cm^2 and depending on the application may require conversion into different units.

BENEFITS

- $25,000 for analyzer compared to over $ 1,000 **per paint sample**
- 20 seconds to get a reading compared to 2 hours to get a sample
- Less than 1 minute compared to 90 days to get data

The Niton Analyzer takes a reading on a painted wall.

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SUMMARY

Lead Paint Analyzer (LPA) will reduce costs and shorten schedules in DOE's Decommissioning Projects—A Niton 700 Series Multi-Element Spectrum Analyzer was demonstrated in FETC's Large-Scale Demonstration and Deployment Project at the Idaho National Engineering and Environmental Laboratory (INEEL). The Niton 700 series analyzer is hand-held, battery operated unit which uses x-ray fluorescence spectroscopy to analyze 25 elements including the presence of lead in paint. The baseline approach to analyze paint for lead content is to collect field samples and send the samples to a laboratory for analysis. Sample collection can take hours and analytical results from the laboratory may not be available for months. Data from the demonstration indicated that the Niton 700 series analyzer provides data equal to or better than laboratory data. With an average laboratory analysis cost per sample of about $1,000, the Niton 700 series analyzer will pay for itself after measuring only 25 samples. The main value of the Niton 700 series analyzer is that it provides a result in about 20 seconds. These results can be used by the decommissioning project manager in making immediate decisions on the appropriate approach to remediate an area of a facility, instead of waiting months for laboratory results. Due to its tremendous benefits, the LPA is expected to be deployed immediately in the INEEL LSDDP and other DOE sites.